ISSN 0031-0301, Paleontological Journal, 2017, Vol. 51, No. 3, pp. 313–325. © Pleiades Publishing, Ltd., 2017.
Original Russian Text © N.B. Gibshman, A.S. Alekseev, 2017, published in Paleontologicheskii Zhurnal, 2017, No. 3, pp. 86–96.

Marine Algal Flora of the Late Viséan (Early Carboniferous) of the Moscow Basin

N. B. Gibshman[a, *] and A. S. Alekseev[a, b, c, **]

[a] *Borissiak Paleontological Institute, Russian Academy of Sciences, Profsoyuznaya ul. 123, Moscow, 117997 Russia*
[b] *Department of Paleontology, Geology Faculty, Moscow State University, Russia*
[c] *Kazan Federal University, Kremlyovskaya ul. 18, Kazan, 420000 Tatarstan, Russia*
**e-mail: nilyufer@bk.ru*
***e-mail: aaleks@geol.msu.ru*

Received July 10, 2014

Abstract—New data on the taxonomic composition of the algal flora of the Late Viséan of the Moscow Basin are discussed based on newly collected material. The algal assemblage comprises 24 taxa, 14 taxa identified to species, nine identified to genus, and one taxon not positively identified. Representatives of the genera *Anthracoporella*, *Anthracoporellopsis*, *Asphaltina*, *Asphaltinella*, *Asteroaoujgalia*, and *Zidella* are recorded for the first time from the Upper Viséan of the Moscow Basin. The large geographic ranges of these benthic calcareous algae suggest a relatively free exchange of the floral elements of the Late Viséan Moscow Basin with the remote basins of North America and the Paleotethys in the Aleksinian and Mikhailovian time. The new data fill an important gap in the current state of knowledge of Late Viséan marine algae.

Keywords: Algae, Carboniferous, Late Viséan, taxonomy, Moscow Basin, Russia
DOI: 10.1134/S0031030117020071

INTRODUCTION

Taxonomic studies of the Late Viséan and Serpukhovian foraminifers of the Moscow Basin, mainly associated with biostratigraphic research, have revealed the presence of a considerable number of taxa of calcareous algae, previously unknown from this region, but which suggest that they played a large role in the benthic communities. This paper discusses the taxonomy and morphology of the Late Viséan algal flora of the Moscow Basin.

HISTORICAL BACKGROUND

Möller (1879; 1880) was the first to describe Late Viséan algae from the Moscow Basin, as three species of Foraminifera *Nodosinella index* (Ehrenberg, 1854), *N. lahuseni* Möller, 1879, and *N. tenuis* Möller, 1879. To characterize their skeletons, Möller used the terms proposed by Brady (1876) for describing foraminifers of the genera *Nodosaria* Ehrenberg, 1854 and *Nodosinella* Brady, 1876, such as shell, chambers, septa, shell wall, and perforations for interconnecting between interiors of chambers. The Carboniferous limestones with remains of algal flora, studied by Möller, were sampled by Struve (1886) in the Kaluga, Tula, and Ryazan regions. Möller studied all objects extracted from the matrix and in thin sections, in which sections of skeletons were correctly oriented relative to their axes of symmetry. It should be noted that Ehrenberg (1854; see explanation of pl. 37, section 11) found *Nodosaria index* in a piece of brown chert from the Tula region, containing *Spirifer mosquensis*. The drawing of this sample shows a ventral valve of a spiriferid brachiopod with a sinus, which quite probably belongs to the Middle Carboniferous– Early Permian genus *Choristites*. This suggests that the type material examined by Ehrenberg had a younger age, but all subsequent authors used for reference descriptions and figures published by Möller for the Late Viséan taxa.

Two of the species described and figured by Möller (1879, pp. 111–115, pl. 5, figs. 5–8), later became the type species of new genera. *Nodosinella lahuseni* Möller, 1879 was designated the type species of the genus *Palaeoberesella* Mamet, 1974, and *Nodosinella index* (Ehrenberg, 1854) Möller, 1879a was designated the type species of the genus *Exvotarisella* Elliott, 1970.

Calcareous algae of the Lower Carboniferous of the Moscow Basin were studied as a separate group of fossil organisms in the course of the lithological study of the carbonate rocks of the Aleksinian–Venevian substages (Shvetsov and Birina, 1935). As a result, a new genus and species, *Calcifolium okense* Shvetsov et Birina, 1935, were described. In addition, these authors recognized two other groups of algae: "tubu-